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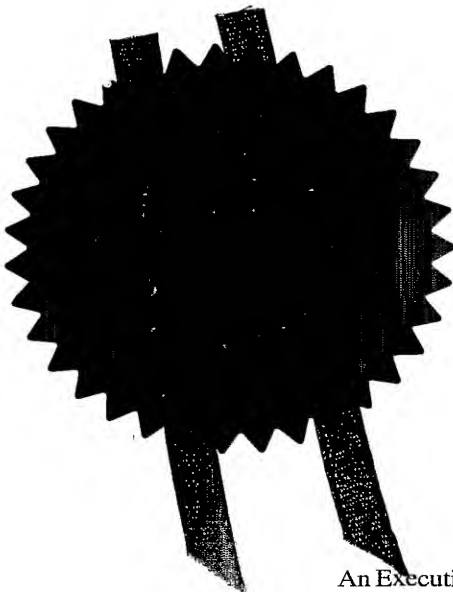
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1. Your reference	03.050-ipw/ph	
2. Patent application number (If you know it)	0329625.8	
3. Full name of the or of each applicant	IPWireless, Inc.	
4. Title of the invention	METHOD AND ARRANGEMENT FOR POWER CONTROL IN A RADIO COMMUNICATION SYSTEM	
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8. Name and daytime telephone number of person to contact in the United Kingdom	Peter Hudson	01420 588399

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Peter Jonathon LEGG
Old Mill Cottage
10 Bakers Road
Wroughton
Swindon
SN4 0RP

Patents ADP number (if you know it): 7500069001

Timothy SPEIGHT
47 Cotham Road
Cotham
Bristol
BS6 6DN

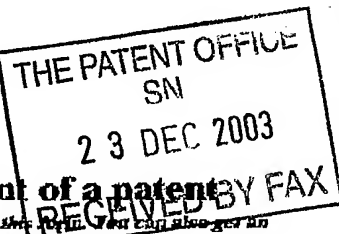
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3. Full name, address and postcode of the or of each applicant (underline all surnames)
IPWireless, Inc.
1001 Bayhill Drive, 2nd Floor
San Bruno, California
CA 94066
- Patents ADP number (If you know it) **08169401002**
- If the applicant is a corporate body, give the country/state of its incorporation **USA, Delaware**
4. Title of the invention **METHOD AND ARRANGEMENT FOR POWER CONTROL IN A RADIO COMMUNICATION SYSTEM**
5. Name of your agent (if you have one) **Peter Hudson**
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)
InetIP
Farringdon House
Kitcombe Lane
Farringdon
Hampshire GU34 3ND
- ELTIMA CONSULTING**
GROVE HOUSE
LUTYENS CLOSE
CHINEHAM COURT
BASINGSTOKE
HAMPSHIRE
R4 24 8AG
08914608001
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Claim(s)	7
Abstract	1
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Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)	3
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23rd December 2003

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Peter Hudson

01420 588399

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DUPLICATE

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METHOD AND ARRANGEMENT FOR POWER CONTROL IN A RADIO
COMMUNICATION SYSTEM

6 **Field of the Invention**

This invention relates to communication systems and particularly (though not exclusively) to Time Division Duplex (TDD) operation in radio communication systems.

10

Background of the Invention

In the field of this invention it is known that power management of Forward Access Channel (FACH) transport channels may be employed in a Universal Mobile Telecommunication System (UMTS) radio communication system.

20 In a 3rd Generation Partnership Project (3GPP) radio communication system, the FACH is a common transport channel used for downlink transmissions. Data destined for a number of User Equipment units (UEs) may be mapped onto FACH(s). The FACHs are then multiplexed by the
25 physical layer, mapped onto Coded Composite Transport Channels (CCTrCHs), and transmitted on Secondary Common Control Physical Channel (S-CCPCH) physical channels. UEs receive the S-CCPCH physical channels, extract the FACH(s) and identify data that is intended for them.
30 Typically the data to be sent on the FACH(s) is

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rescheduled every Transmission Time Interval (TTI) (where TTI = 10, 20, 40 or 80 ms).

The concept of applying power management on the FACH is well established in the prior art. For example, in published US patent application no. US 2002/0094833 A1 it is known that the transmit power is regulated according to:

UE measurements

- received signal strength
- SIR (Signal to Interference Ratio)
- Error rates (Block Error Rate - BLER, Bit Error Rate - BER)

Current conditions in the cell

- traffic volume
- % max BTS (percentage of maximum Base Transmitter Station) power in use.

Service requirements of the UE.

In document "MBMS Power Usage" (available from the 3GPP website at www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_31/Docs/Zips/R2-022110.zip) and document "Comparison of DSCH and FACH for MBMS use" (available from the 3GPP website at www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_31/Docs/Zips/R2-022110.zip) power control of the FACH has also been suggested in 3GPP for broadcast usage (MBMS, Multimedia Broadcast Multicast Service). Here the suggestion is made that if the network knows the geometry of the MBMS users in the cell, the transmission power can be set just enough to serve all users subscribing to the MBMS service instead of blindly using the power to cover the whole cell.

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However, a disadvantage of these and similar prior art schemes is the difficulty of estimation of the power needs of individual UEs.

5

A need therefore exists for a method and arrangement for power control in a radio communication system wherein the abovementioned disadvantage(s) may be alleviated.

10

Statement of Invention

In accordance with the present invention there is provided a method and arrangement for power control in a
15 radio communication system as claimed in claim 1.

Brief Description of the Drawing(s)

20 One method and arrangement for power control in a radio communication system incorporating the present invention will now be described, by way of example only, with reference to the accompanying drawing(s), in which:

25 FIG. 1 shows a block schematic diagram illustrating a 3GPP radio communication system in which the present invention may be used;

FIG. 2 shows a schematic diagram illustrating
30 multiplexing of FACH transport channels onto a single CCTrCH;

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FIG. 3 shows a schematic diagram illustrating use of four CCTrCHs of S-CCPCH type to carry four FACHs;

5 FIG. 4 shows a block schematic diagram illustrating an power control arrangement incorporating an embodiment of the present invention;

10 FIG. 5 shows a schematic diagram illustrating an arrangement of queued FACH traffic;

15 FIG. 6 shows a schematic diagram illustrating traffic queued by Transport Format Combination Set (TFCS) band and served one band at a time;

FIG. 7 shows a schematic diagram illustrating banding of UEs on the DSCH into different TFCSS; and

20 FIG. 8 shows a schematic diagram illustrating a FACH power cost scheme.

Description of Preferred Embodiment(s)

25 The following preferred embodiment of the present invention will be described in the context of a UMTS Radio Access Network (UTRAN) system operating in TDD mode. Referring firstly to FIG. 1, a typical, standard UMTS Radio Access Network (UTRAN) system 100 is
30 conveniently considered as comprising: a terminal/user

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equipment domain 110; a UMTS Terrestrial Radio Access Network domain 120; and a Core Network domain 130.

In the terminal/user equipment domain 110, terminal
5 equipment (TE) 112 is connected to mobile equipment (ME) 114 via the wired or wireless *R* interface. The ME 114 is also connected to a user service identity module (USIM) 116; the ME 114 and the USIM 116 together are considered as a user equipment (UE) 118. The UE 118 communicates
10 data with a Node B (base station) 122 in the radio access network domain 120 via the wireless *Uu* interface. Within the radio access network domain 120, the Node B 122 communicates with a radio network controller (RNC) 124 via the *Iub* interface. The RNC 124 communicates with other
15 RNC's (not shown) via the *Iur* interface. The Node B 122 and the RNC 124 together form the UTRAN 126. The RNC 124 communicates with a serving GPRS service node (SGSN) 132 in the core network domain 130 via the *Iu* interface. Within the core network domain 130, the SGSN 132
20 communicates with a gateway GPRS support node (GGSN) 134 via the *Gn* interface; the SGSN 132 and the GGSN 134 communicate with a home location register (HLR) server 136 via the *Gr* interface and the *Gc* interface respectively. The GGSN 134 communicates with public data
25 network 138 via the *Gi* interface.

Thus, the elements RNC 124, SGSN 132 and GGSN 134 are conventionally provided as discrete and separate units (on their own respective software/hardware platforms)
30 divided across the radio access network domain 120 and the core network domain 130, as shown in FIG. 1.

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The RNC 124 is the UTRAN element responsible for the control and allocation of resources for numerous Node B's 122; typically 50 to 100 Node B's may be controlled by one RNC. The RNC also provides reliable delivery of user traffic over the air interfaces. RNC's communicate with each other (via the *Iur* interface) to support handover and macrodiversity.

The SGSN 132 is the UMTS Core Network element responsible for Session Control and interface to the HLR. The SGSN keeps track of the location of an individual UE and performs security functions and access control. The SGSN is a large centralised controller for many RNCs.

The GGSN 134 is the UMTS Core Network element responsible for concentrating and tunnelling user data within the core packet network to the ultimate destination (e.g., internet service provider - ISP).

Such a UTRAN system and its operation are described more fully in the 3GPP technical specification documents 3GPP TS 25.401, 3GPP TS 23.060, and related documents, available from the 3GPP website at www.3gpp.org, and need not be described in more detail herein.

FIG. 2 illustrates one use of the FACH. Here two FACH transport channels (FACH1, 210; FACH2, 220) are mapped to the same CCTrCH, 230, that is carried on a number of 5-CCPCH physical channels. FACH1 carries either 0 or 1 user plane transport block, whilst FACH 2 carries either 0, 1

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or 2 blocks of signalling traffic. Either a user plane block or 2 signalling blocks may be carried by the CCTrCH.

- 5 FACH2 is shared amongst all UEs, even during the same TTI. The UE, on receiving the S-CCPCH, identifies which signalling blocks are directed to itself by the UE ID field in the Medium Access Control (MAC) header (as described in 3GPP technical specification document
- 10 25.321, available from the 3GPP website) for the case of DCCH (Dedicated Control Channel) logical channel or by inspection of the UE ID within the RRC (Radio Resource Control) message for the case of CCCH (Common Control Channel) and SHCCH (Shared Control Channel).

15

To accommodate the variable rate of the CCTrCH, the number of physical codes is adjusted, and the Transport Format Combination Indicator (TFCI) carried on the physical channel is used to identify this choice (as

20 described in 3GPP technical specification document 25.221, available from the 3GPP website).

Since the FACH is a common channel, the physical channels need to be transmitted with sufficient power such that

25 all UEs targeted are able to decode the content.

Typically the transmission has taken place at full power so that even if a UE at the cell edge is targeted, it would be able to decode the transmission (this is a worst case assumption). However, this is potentially wasteful

30 of power if, for example, all the UEs targeted were to lie near the cell centre. Clearly, by only transmitting

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with sufficient power to satisfy the user with the greatest path loss from the basestation, power could be saved which may be exploited by other physical channels (not S-CCPCH). Furthermore, there is the alternative of
5 scheduling more FACH blocks within the same (maximum) power.

FIG. 3 shows an alternative approach to using the FACH. Here four CCTrCHs (CCTrCH1, 310; CCTrCH2, 320; CCTrCH3,
10 330; CCTrCH4, 340), each of S-CCPCH type, are established, each supporting a single FACH. During a transmission a single FACH only carries traffic for a single UE. The UEs within the cell are subdivided into those that listen to CCTrCH1 only, those that listen to
15 CCTrCH2 only, etc.

In this arrangement, without knowledge of the power requirements of different UEs the worst case must be assumed, where each FACH is carrying data to a UE at the
20 extreme cell edge, and each CCTrCH consumes the corresponding power.

It is apparent that gains in throughput (or reductions in power consumption) are achievable if some form of power
25 control can be introduced, whether a single S-CCPCH CCTrCH (as in FIG. 2) or many (as in FIG. 3) are employed.

As will be explained in greater detail below, an
30 important feature of the present invention, at least in its preferred embodiment, is the use of power control to

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a UE on the downlink shared channel (DSCH) to determine the UEs power requirement on the FACH.

Referring now to FIG. 4, a power control arrangement 400 for implementing such an embodiment of the present invention includes a module 410 for deriving DSCH power control information, and a module 420 for receiving the DSCH-derived power control information and for performing in dependence thereon FACH power control. Whilst not inapplicable for Frequency Division Duplex (FDD) operation, this scheme is particularly well suited to TDD operation. This is because in TDD the DSCH may be used in the same UE state as the FACH (this is called 'Cell FACH state') without the need to allocate dedicated resources (as described in 3GPP technical specification document 25.331, available from the 3GPP website). In other words, a UE can be served on the DSCH; power information can be extracted using the DSCH power control mechanism, and then the UE can be rapidly and easily served on the FACH, exploiting the power information gleaned from the DSCH operation. DSCH operation in Cell FACH state is not possible for FDD; the UE must move to Cell DCH state where it is granted dedicated resource, in which it may receive DSCH (and FACH too, although this requires that the UE has the capability to decode three CCTrCHs at the same time).

Referring now to FIG. 5, in a preferred embodiment of the present invention the FACH blocks are queued in one of n queues $510_1, 510_2, \dots, 510_n$, according to the CCTrCH that the targeted UE is listening to. Each CCTrCH may employ up to

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k_i spreading factor 16 (SF16) codes. The code sets allotted to each CCTrCH are disjoint; the total number of codes over all CCTrCHs must be less than or equal to 16.

5 Pseudo code for the operation of the FACH scheduler is given below. The key operation is the calculation of the power cost of a CCTrCH when supporting a transport format combination (TFC). A TFC represents a particular combination of FACH blocks on the FACH transport channels of the CCTrCH. The power cost is defined as the fraction
10 of the maximum transmit power of the basestation. To calculate the power cost, p , we calculate the difference of:

- 15 • the wanted signal divided by the level of noise + interference (C/I) at the UE j if it were to be served with the complete basestation power $C/I_{\max,j}$ (this is determined from the DSCH power control to the UE), and
 - the C/I required to support the TFC, C/I_{TFC}
- 20 where both quantities are measured in dB, i.e.:

$$p_{TFC,j} = 10^{(C/I_{\max,j} - C/I_{TFC})/10}$$

It will be understood that, as used herein, the terms 'noise' and 'interference' are to be considered
25 synonymous, with each encompassing both noise and interference, and that the term 'signal/interference' encompasses 'signal/(noise + interference)'.

Since FACH blocks may be scheduled from more than one UE
30 onto the same CCTrCH, the power cost should be calculated

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assuming the worst case of the UEs scheduled, i.e., the UE with the smallest $C/I_{\max,j}$.

```

Queue = start_queue /* e.g. every run of the algorithm
5                      we increment the start_queue by 1
                      (modulo n) */

  Do
    Do
      Take the next FACH transport block from
10      'queue'
      Calculate TFC resulting from adding the
      block
      Calculate power cost for this CCTrCH
      carrying TFC
15      Accept FACH block to schedule if
          cumulative power cost of all CCTrCHs <= 1
      While (cumulative power cost of all CCTrCHs <= 1 AND
           $k_{queue}$  codes can take more blocks AND queue is not
          empty)
20      Queue = (queue + 1)mod n /* go to next queue */
      While (cumulative power cost of all CCTrCHs <= 1 AND NOT
          all queues addressed)

```

Note: if DSCH power control information is not available
25 for UE j , the scheduler should assume the user lies at the
cell edge, and use a $C/I_{\max,j}$ value appropriate for such a
user, either preprogrammed within the scheduler or
updated in response to information obtained from DSCH

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power control (the scheduler would maintain the minimum value of $C/I_{\max,j}$ of all UEs served).

It should be noted that the C/I_{TFC} values may be fixed
5 (and preprogrammed into the scheduler) or updated continuously according to measurements made by UEs.

If the FACH CCTrCH is configured to support a number of UEs in the same transmission, it is advantageous to serve
10 UEs with approximately the same $C/I_{\max,j}$ at the same time, since the worst-case $C/I_{\max,j}$ is assumed by the scheduler, as discussed above. One embodiment that exploits this, for the case when there is a single FACH CCTrCH ($n=1$), is shown in FIG. 6. Here queue Q1 is subdivided into 8
15 subqueues, denoted TFCS1 to TFCS8 ($610_1, 610_2 \dots 610_8$), and users are placed in the subqueue which reflects their $C/I_{\max,j}$ value. In this embodiment, these correspond to the TFCS banding employed (see below). Different mechanisms for serving the subqueues can be employed; FIG. 5
20 illustrates a round-robin scheduler 620 that addresses a different subqueue for each transmission.

In another embodiment of the invention, suppose the usage of FACHs is as shown in FIG. 5; although, each CCTrCH is
25 restricted to use two codes (not four, because of hardware limitations of the UE receiver). According to the UEs power requirements on the DSCH, a UE is banded into one TFCS, from TFCS 1 to TFCS8 (710), plus "TFCS1 cell edge 1" (720) and "TFCS1 cell edge 2" (730) bands,
30 as shown in FIG. 7. Essentially, the different TFCSs from

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1 to 8 express the channel coding rate that may be employed with a given transmit power to the UE, whilst attaining the required signal to noise ratio. For example, UEs near the cell centre experience low path loss and low interference; they are placed in TFCS8 which has a code rate close to unity (i.e., it has very little redundancy to protect against noise). In contrast, with TFCS1, used by UEs that are very close to the cell edge, the code rate is approximately - a lot more error protection is required at the cell edge. UEs that experience a C/I lower than the TFCS1 band are assigned to "TFCS1 cell edge 1", or "TFCS1 cell edge 2". In the cell edge 1 band a UE is given twice the power per code of a TFCS1 UE, and in cell edge 2 the UE is given four times the power per code. This is accomplished by limiting the number of codes used in a timeslot (compared to TFCS1, half the number of codes is used in cell edge 1 and a quarter of the number of codes is used in cell edge 2). The channel coding applied to the cell edge bands is identical to TFCS1. Power control of the DSCH is examined by the RNC, and decisions to switch a UE between TFCSS can then be made (as in published patent publication WO 03/049320). The TFCSS in use is then used in determining the power consumption on the FACH when serving this UE (see below for details) - this is the 'power cost' introduced above. Consequently, the number of FACHs that may be scheduled is determined. For example, four UEs of band status from 1 to 8 may be served (on four FACHs, four S-CCPCH CCTRCHs), but if a cell edge 2 UE is to be served then only this UE may be served in this frame.

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The power costs calculated are given in Table 1 below
(for the case where 1 FACH is mapped to 2 S-CCPCH codes).

TFCS	FACH power cost
TFCS1	1.00
cell edge 2	
TFCS1	0.50
cell edge 1	
TFCS1	0.25
TFCS2	0.25
TFCS3	0.25
TFCS4	0.25
TFCS5	0.25
TFCS6	0.25
TFCS7	0.25
TFCS8	0.25

Table 1

- 5 It should be noted that when transmitting to users from any of the TFCS bands from 2 to 8, the same power cost as TFCS1 is assumed. A more sophisticated algorithm that adjusts the power cost across the complete TFCS range is described below.

10

Clearly the number of FACHs transmitted will now be variable since it will depend on the DSCH TFCS which is applied to the UEs to which the FACHs are to be sent. The MAC will be required to provide this scheduling and
15 determine how many FACHs that can be let through to Layer 1 and be consequently be transmitted.

It is likely that at any one time FACHs will be needed to be transmitted to users which are on different DSCH TFCS
20 and therefore a scheme will be employed in the MAC based on ratio of the total power available to the required

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power for each FACH (called a FACH power cost), as illustrated in FIG. 8, where four FACHs (810_1 , 810_2 , 810_3 and 810_4) are to be transmitted.

- 5 All messages sent on the Common Control Channel (CCCH), or where the DSCH TFCS is not known, will have a FACH cost of 1.0.

- 10 An enhancement of the invention performs the power management under the assumption that the *C/I* should be met but not exceeded for users in different bands. In this enhancement, Table 1 may be revised as follows:

TFCS	FACH power cost
TFCS1	1.00
cell edge 2	
TFCS1	0.50
cell edge 1	
TFCS1	0.25
TFCS2	0.19
TFCS3	0.13
TFCS4	0.09
TFCS5	0.07
TFCS6	0.05
TFCS7	0.03
TFCS8	0.01

Table 2

- 15 When using Table 2, the FACH power control must ensure that the available FACH CCTrCH code resource is not exceeded as FACH blocks are added to the schedule. With Table 1 this is not necessary, since the minimum power cost of 0.25 ensures that at most four FACHs (which
- 20 corresponds to 8 S-CCPCH codes) can be scheduled, which represents the code limitation of FACH CCTrCHs.

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It will be understood that the present invention is not limited to FACH power determination based upon the method of TFCS selection described above. The FACH power may be estimated provided that indication of the DSCH power consumption is passed to the FACH scheduler, located within the RNC.

Under typical conditions, the FACH and DSCH timeslots are heavily loaded, and the *C/I* achievable in these slots is approximately equal. In such circumstances, the FACH power management scheme should work well. However, if the network is lightly loaded, either in FACH or DSCH slots, then the performance of the algorithm is impacted. For this reason, the RNC may determine whether to use the power control algorithm based on DSCH operation (as described above) or a conventional measurement based calculation of the *C/I* achievable at the UE. In this way, the DSCH based algorithm may only be used if the loading on the DSCH in the neighbouring cells is high (the mean code consumption over a set of neighbour cells on the DSCH in the timeslots for which the UE has been granted DSCH resource over a predefined time period exceeds a threshold) and the immediate loading on the FACH is high in the neighbouring cells (determined using a threshold on the queued FACH traffic across the neighbour cells).

It will be understood that the method and arrangement for power control in a radio communication system described above provides the following advantages:

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- maximisation of throughput on FACH(s)
- exploitation of DSCH power control removes the need for additional measurements to be taken by the UE

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Claim(s)

1. A method for power control in a communication system employing first and second channels, comprising:
 - 5 applying power control on the first channel;
 - deriving power control information from the power control on the first channel; and
 - applying to the second channel the derived power control information from the power control on the
 - 10 first channel in order to produce power control on the second channel.
2. The method of claim 1 wherein the second channel comprises a forward access control channel.
- 15 3. The method of claim 1 or 2 wherein the first channel comprises a downlink shared control channel.
4. The method of any one of claims 1-3 wherein the step
20 of deriving power control information from the power control on the first channel comprises deriving power control information from a radio network control power control function.
- 25 5. The method of any one of claims 1-3 wherein the step of deriving power control information from the power control on the first channel comprises deriving power control information from a base station power control function.

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6. The method of any one of claims 1-3 wherein the step of deriving power control information from the power control on the first channel comprises deriving power control information from transport format combination set selection.

7. The method of any one of claims 1-6 wherein the step of applying power control information to the second channel comprises scheduling a plurality of second channels in dependence on the derived power control information.

8. The method of claim 7 wherein the step of scheduling comprises scheduling the plurality of second channels based on signal/interference difference power cost calculation.

9. The method of claim 7 or 8 wherein the step of scheduling comprises scheduling the plurality of second channels based on fixed signal/interference values.

10. The method of claim 7 or 8 wherein the step of scheduling comprises scheduling the plurality of second channels based on dynamically updated signal/interference values.

11. The method of any one of claims 1-10 wherein the step of applying power control information to the second channel comprises queueing and serving of mobile stations with similar power requirements on a same second channel at the same time.

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12. The method of any one of claims 1-11 wherein the system is a time division duplex communication system.
- 5 13. The method of any one of claims 1-12 wherein the system comprises a UMTS wireless system.
14. The method of claim 13 wherein the system comprises a 3GPP system.

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15. An arrangement for power control in a communication system employing first and second channels, the arrangement comprising:

means for applying power control on the first channel;

5 means for deriving power control information from the power control on the first channel; and

means for applying to the second channel the derived power control information from the power control on the first channel in order to produce power control
10 on the second channel.

16. The arrangement of claim 15 wherein the second channel comprises a forward access control channel.

15 17. The arrangement of claim 15 or 16 wherein the first channel comprises a downlink shared control channel.

18. The arrangement of any one of claims 15-17 wherein the means for deriving power control information from the power control on the first channel comprises means for
20 deriving power control information from a network control power control function.

19. The arrangement of any one of claims 15-17 wherein
25 the means for deriving power control information from the power control on the first channel comprises means for deriving power control information from a base station power control function.

30 20. The arrangement of any one of claims 15-17 wherein the means for deriving power control information from the

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power control on the first channel comprises means for deriving power control information from transport format combination set selection.

- 5 21. The arrangement of any one of claims 15-20 wherein the means for applying power control information to the second channel comprises means for scheduling a plurality of second channels in dependence on the derived power control information.
- 10 22. The arrangement of claim 21 wherein the means for scheduling comprises means for scheduling the plurality of second channels based on signal/interference difference power cost calculation.
- 15 23. The arrangement of claim 21 or 22 wherein the means for scheduling comprises means for scheduling the plurality of second channels based on fixed signal/interference values.
- 20 24. The arrangement of claim 21 or 22 wherein the means for scheduling comprises means for scheduling the plurality of second channels based on dynamically updated signal/interference values.
- 25 25. The arrangement of any one of claims 15-24 wherein the means for applying power control information to the second channel comprises means for queueing and serving of mobile stations with similar power requirements on a
- 30 same second channel at the same time.

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26. The arrangement of any one of claims 15-25 wherein the system is a time division duplex communication system.

5 27. The arrangement of any one of claims 15-26 wherein the system comprises a UMTS wireless system.

28. The arrangement of claim 27 wherein the system comprises a 3GPP system.

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29. A network control element comprising the arrangement of claim 18 or any one of claims 18-28 when dependent from claim 18.

15 30. A base station element comprising the arrangement of claim 19 or any one of claims 19-28 when dependent from claim 19.

31. A method, for power control in a communication
20 system, substantially as hereinbefore described with reference to the accompanying drawings.

32. An arrangement, for power control in a communication
25 system, substantially as hereinbefore described with reference to the accompanying drawings.

33. A base station element, for power control in a communication system, substantially as hereinbefore described with reference to the accompanying drawings.

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34. A network control element, for power control in a communication system, substantially as hereinbefore described with reference to the accompanying drawings.

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Abstract

METHOD AND ARRANGEMENT FOR POWER CONTROL IN A
COMMUNICATION SYSTEM

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A method and arrangement, for power control in a communication system (100) employing first and second channels, by: applying power control on the first channel, deriving (910) power control information from the power control on the first channel, and applying (920) to the second channel the derived power control information from the power control on the first channel in order to produce power control on the second channel. Preferably, DSCH power control is used to determine power consumption on FACH. The power control information may be obtained: directly from RNC power control entity (if RNC based power control), or indirectly from Node B power control entity (if TPC power control at the Node B). The power control on the second channel may be obtained: via TFCS selection, scheduling of FACHs (number of codes / data rate) using a power management calculation based on the above, power cost calculation using C/I difference method, use of fixed or dynamically updated C/I values, or queueing and serving of UEs with similar power requirements on the FACH at the same time.

This provides the following advantage(s):

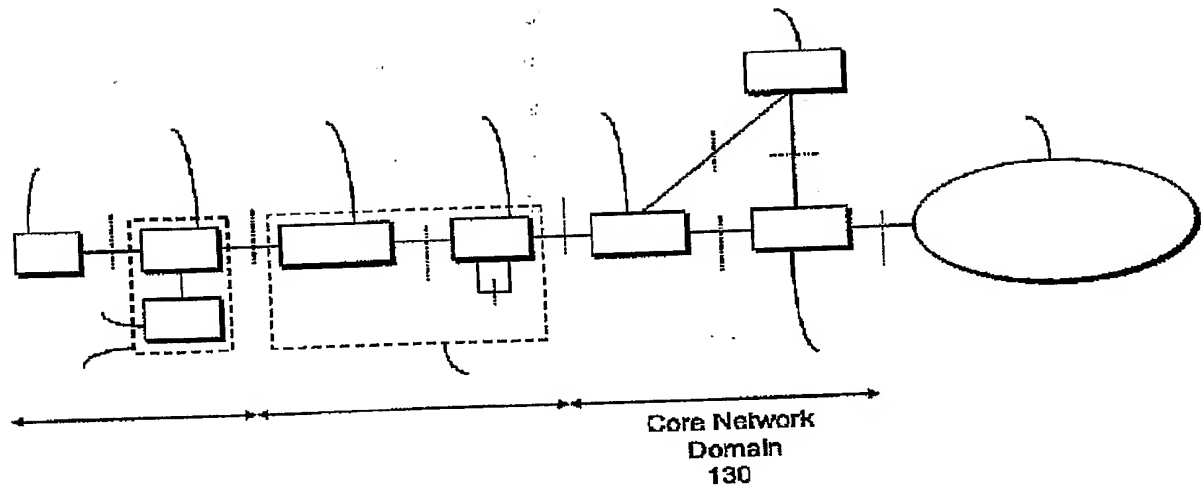
- maximisation of throughput on FACH(s)
- exploitation of DSCH power control removes the need for additional measurements to be taken by the UE.



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User plane traffic

Signalling traffic

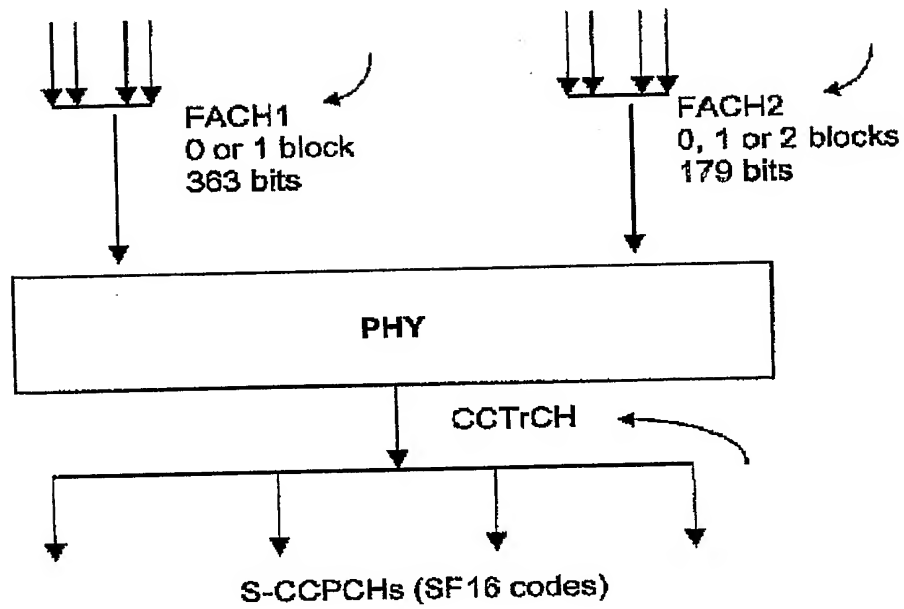


FIG. 2



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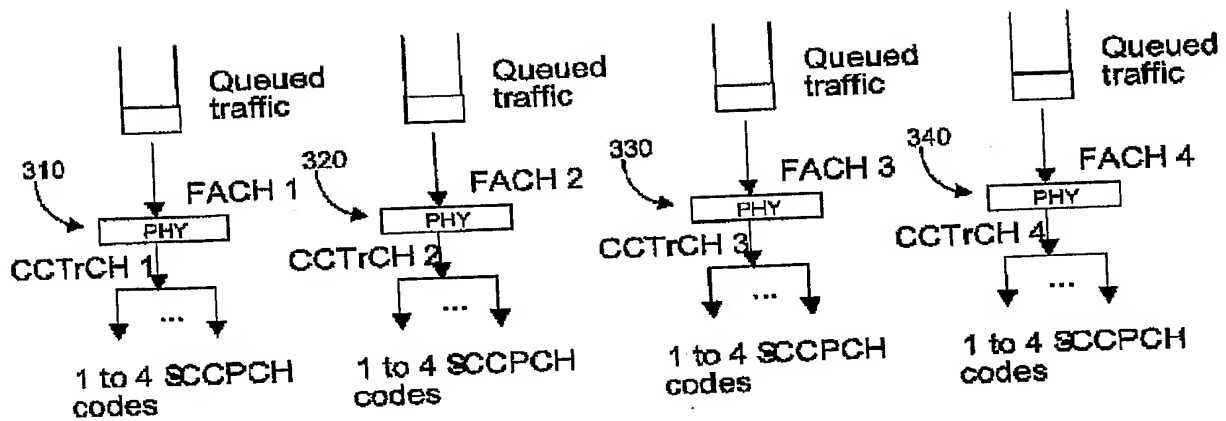
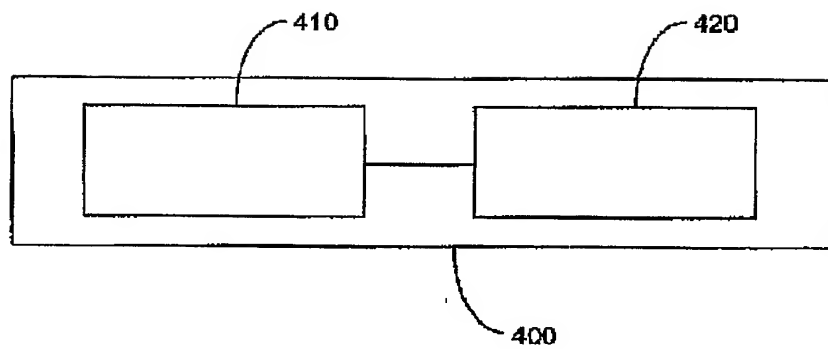


FIG. 3



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**FIG. 4**

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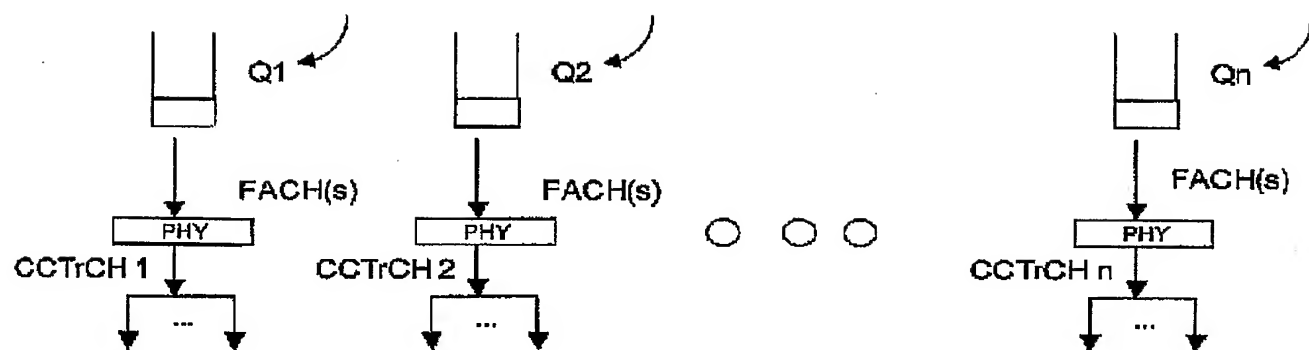


FIG. 5



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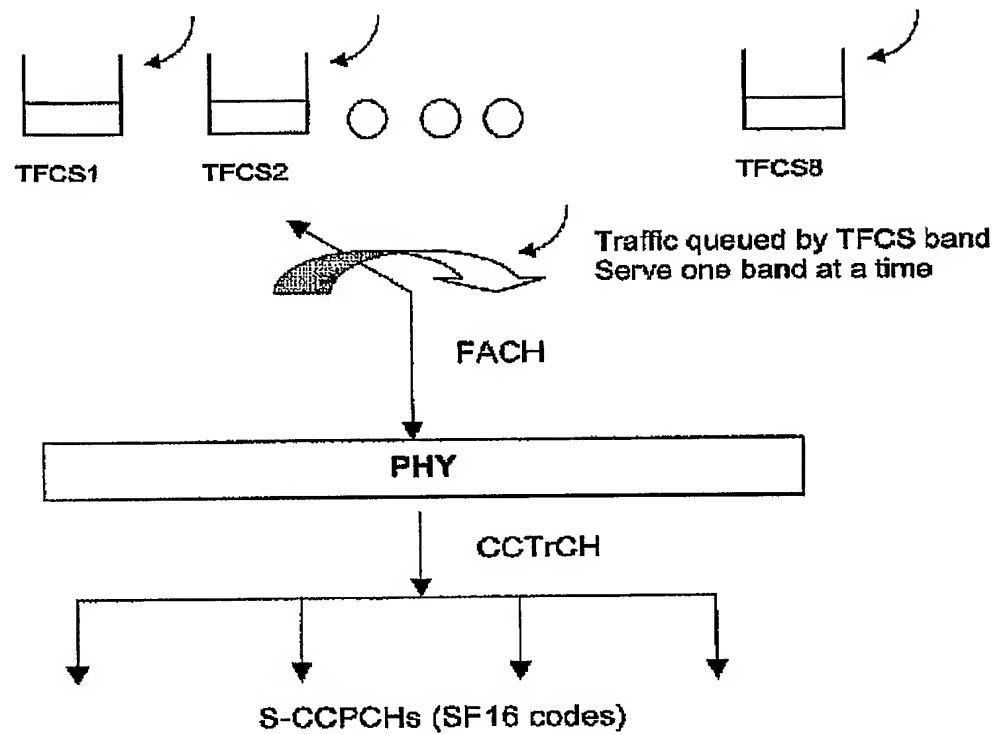


FIG. 6



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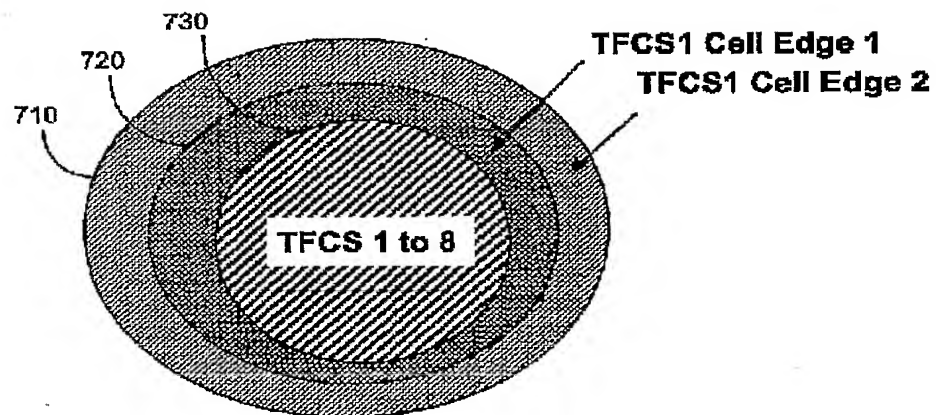


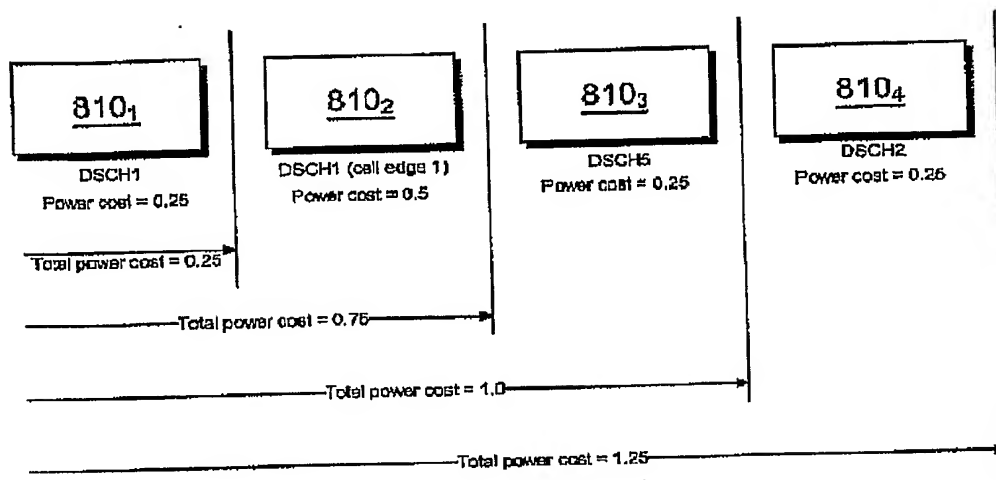
FIG. 7



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In this TTI can send FACH 1, 2 and 3.
Cannot send FACH 4 in this TTI.

FIG. 8

